2008

The Relationship between Perceived Personal Risk of getting Prostate cancer and Prostate-Specific Antigen (PSA) Screening

Yeatoe G. McIntosh
Virginia Commonwealth University

MPH Research Project Approval Form

(The Relationship between Perceived Personal Risk of getting Prostate Cancer and Prostate-Specific Antigen Testing)

Submitted to the Graduate Faculty of the
Department of Epidemiology and Community Health
Virginia Commonwealth University

In partial fulfillment of the requirements for the degree of
Master of Public Health

(by: Yeatoe G. McIntosh)

Comments:

Approval signatures:

Yeatoe G. McIntosh 08/01/08
MPH Student Date

8/1/08
MPH Research Project Faculty Advisor Date

8/1/08
MPH Program Director Date

8/1/08
MPH Program Coordinator Date

Master of Public Health
Research Project Agreement Form
Department of Epidemiology and Community Health

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Number of semester hours (3-6): 3 Semester: Summer Year: 2008

Please complete the following outline. Do not exceed 2 pages (A-H).

A. PROJECT TITLE:
The relationship between screening for prostate cancer with the PSA test and perceived personal risk.

B. PURPOSE (state hypothesis/research question):
We hypothesized that prostate cancer screening is associated with perceived personal risk of prostate cancer.

C. SPECIFIC OBJECTIVES (list major aims of the study):
- To determine if there is an association between screening for prostate cancer with the PSA test and perceived personal risk.
- To evaluate if there is a disparity of screening by race, age, level of education, marital status, annual household income, and health care coverage.

D. DESCRIPTION OF METHODS

D.1. Identify source(s) of data (eg, existing data set, data collection plans, etc):
- (2003) Health Information National Trends Survey (HINTS)

D.2. State the type of study design (eg, cross-sectional, cohort, case-control, intervention, etc):
- Cross-sectional study design

D.3. Describe the study population and sample size:
- Study Population consists of 6,369 and sample size is 1815 U.S. civilians, non-institutionalized adult age 18 and over.

D.4. List variables to be included (If a qualitative study, describe types of information to be collected)
- Screening: Measured by if you ever had a Prostate-Specific Antigen (PSA) test.

- Perceived personal risk measured by: perceived chance of developing prostate cancer (how likely an individual thinks it is that he will develop prostate cancer in the future).
- Covariates: Race, age, level of education, marital status, annual household income, , and health care coverage.

D.5. Describe methods to be used for data analysis (If a qualitative study, describe general approach to compiling the information collected)

- Descriptive analyses and regression analyses-logistic regression.

E. ANTICIPATED RESULTS:

F. SIGNIFICANCE OF PROJECT TO PUBLIC HEALTH:

G. IRB Status:

1) Do you plan to collect data through direct intervention or interaction with human subjects? ___yes __X__no

2) Will you have access to any existing identifiable private information? ___yes __X__no

If you answered "no" to both of the questions above, IRB review is not required. If you answered "yes" to either one of these questions, your proposed study must be reviewed by the VCU Institutional Review Board (IRB). Please contact Dr. Turf or Dr. Buzzard for assistance with this procedure.

Please indicate your IRB status:
___ to be submitted (targeted date_____)
___ submitted (date of submission _____; VCU IRB # _____)
___ IRB exempt review approved (date_____)
___ IRB expedited review approved (date_____)
___ IRB approval not required

H. PROPOSED SCHEDULE: Start Date: 06/2008 Anticipated End Date: 07/2008

I. INDICATE WHICH OF THE FOLLOWING AREAS OF PUBLIC HEALTH KNOWLEDGE WILL BE DEMONSTRATED:

1. Biostatistics – collection, storage, retrieval, analysis and interpretation of health data; design and analysis of health-related surveys and experiments; and concepts and practice of statistical data analysis. __X_yes ___no (if yes, briefly describe):
   - To analyze and interpret the HINTS Survey (2003)

2. Epidemiology – distributions and determinants of disease, disabilities and death in human populations; the characteristics and dynamics of human populations; and the natural history of disease and the biologic basis of health. __X_yes ___no (if yes, briefly describe):
   - To determine the characteristics and dynamics of the American population in relation to perceived personal risk for prostate cancer and screening.

3. Environmental Health Sciences – environmental factors including biological, physical and chemical factors which affect the health of a community. ___yes __X__no (if yes, briefly describe):

4. Health Services Administration – planning, organization, administration, management, evaluation and policy analysis of health programs. ___yes __X__no (if yes, briefly describe):

5. Social/Behavioral Sciences – concepts and methods of social and behavioral sciences relevant to the identification and the solution of public health problems. __X__yes ___no (if yes, briefly describe):

   - We'll utilize concepts and research methods of behavioral science to identify the relationship between perceived personal risk for prostate cancer, screening knowledge and screening (behavior). In addition, we'll use theories of social/behavioral sciences to suggest possible interventions related to screening in order to address the death rate due to prostate cancer.

SIGNATURE PAGE
Master of Public Health Research Project

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The Relationship between Perceived Personal Risk of getting Prostate cancer and Prostate-Specific Antigen (PSA) Screening

Yeatoe G. McIntosh, MPH Candidate
Advisor: Emmanuel Anum, MBChB, MPH, PHD
Preceptor: Emmanuel Anum, MBChB, MPH, PHD

Acknowledegment

Praise God from whom all blessings flow!
This work is dedicated to the below mentioned names for their prayers, love and support of me.

Mr. Charles and Mrs. Margarette D. McIntosh, Parents
Mrs. Mary Wreh, Grandmother
The Late Frank G. Mellish, Grandfather
The Late Julia Lincoln, Aunty
The Late Caroline McIntosh Goodridge, Aunty
Mr. Emmanuel Anum, Advisor
Ms. Karen Bryant
My Siblings, Family, and friends.

Thanks be to God!

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Abstract

Title: The Relationship between Perceived Personal Risk of getting Prostate cancer and Prostate-Specific Antigen (PSA) Screening

Yeatoe G. McIntosh, MPH Candidate
Advisor: Emmanuel Anum, MBChB, MPH, PHD
Preceptor: Emmanuel Anum, MBChB, MPH, PHD

Background: Prostate cancer is one of the most common cancer diagnoses in the United States. The American Cancer Society estimates that in 2008 28,660 deaths would be attributed to prostate cancer, projecting it to be the leading cause of cancer deaths in U.S. men. Despite the potential threat this cancer presents to men and the potential for improved disease outcomes from early detection, guidelines for screening for prostate cancer are varied, and disparities in screening prevalence exist. In addition, disparities in knowledge about prostate cancer screening and misconceptions about the disease seem widespread. The main purpose of this study was to determine the relationship between perceived personal risk of getting prostate cancer and prostate cancer screening with the Prostate-specific antigen (PSA) test.

Methods: Data were collected from the 2003 Health Information National Trends Survey (HINTS). Overall, 1,815 men ages 35 and above were included in the sample after exclusion of men ages 18-34. Logistic regression analyses were conducted to assess the association between perceived personal risk and prostate cancer screening with PSA test, while testing for interaction and further adjusting for possible confounders. A reduced model, in which variables with non-significant Wald chi-squared statistic had been excluded, was compared to the full model to access the change in parameter estimates. Using the model-based approach, we compared models with interaction terms to the one without interaction terms using the likelihood ratio test. Parameter estimates from the best fitting model were reported using the design-based method. SAS version 9.1 statistical software was used for analyses.

Results: Among men ages 35-49, those who perceived their risk as high, were significantly less likely to screen than those who perceived their risk as low (OR: 0.20 95% CI: 0.05-0.78). Within ages 50-64 and 65 and above, there were no significant differences between perceived risk levels and PSA testing. Men, who did receive healthcare provider recommendation for screening, were more likely to obtain prostate cancer (PSA) screening than men who did not receive such recommendation (OR: 92.56 95% CI 36.56, 234.36).

Conclusions: The relationship between perceived personal risk of getting prostate cancer and PSA screening is modified by age. As men aged, their odds of screening increased. The most significant predictor of PSA screening was health provider recommendation. PSA screening showed no association with either race or household income.

Introduction and background:

Cancer is the second leading cause of mortality in the United States following heart disease.[1] With seventy-six percent of all cancers being diagnosed in individuals 55 years and older, cancer is a common chronic disease in the older population. Cancer is triggered by both external factors such as tobacco, chemicals, radiation, and infectious organisms, and internal factors such as hormones, inherited mutations, immune conditions, and mutations occurring from metabolism.[2] The American Cancer Society (ACS) reported that approximately 559,650 deaths in the U.S. would have been due to cancer in 2007, equating to over 1,500 cancer deaths per day.[3]

Poor health behaviors play a significant role in the development of cancer. Although cancer caused by the use of tobacco could be prevented, ACS estimated that in 2008 in the United States (U.S.), about 170,000 cancer deaths would be associated with the use of tobacco.[3] Additionally, in 2008, about one-third of the expected cancer deaths are predicted to be related to nutrition, physical inactivity, overweight and obesity.[3] However, modifying these poor health behaviors is a step to changing modifiable risks factors such as physical inactivity and inadequate nutrition.

Everyone is at risk of developing cancer, and the risk of developing most cancers has been demonstrated to increase with increasing age. Among men worldwide, one of the most common cancer diagnoses is prostate cancer.[2] Prostate cancer incidence varies across the world, with the highest incidence occurring in the United States, Canada, and Scandinavia, and the lowest in parts of Asia, including China.[3] In the U.S., new cases of prostate cancer exceeded lung cancer in 2006 as the most common cancer

diagnosis amongst men.[1] Prostate cancer was the third leading cause of cancer deaths among U.S. men in 2006, following colon and rectal cancer deaths.[2] In 2007, prostate cancer was the second leading cause of cancer death in U.S. men.[2] However, in 2008, prostate cancer is expected to be the leading cause of cancer deaths in U.S. men, with an estimated 28,660 deaths.[3]

Early detection through screening reduces mortality and prevents morbidity from symptoms associated with urological function, bleeding and obstruction, and pain associated with metastases.[4] Screening has led to early detection of prostate cancer.[4] There is no definitive guideline on the optimal age for initiation of screening. However, ages covered in screening trials range from 45-80 years.[4] The American Cancer Society has recommended that prostate cancer screening begin at age 50 years, and should include prostate-specific antigen (PSA) testing.[2] An exception to this recommendation is men with a family history of prostate cancer and African American men; for these individuals, it is recommended that screening begin at age 45, due to a higher risk in these populations.[3] Catalona and colleagues have recommended an even lower age for screening among men belonging to a higher risk race group, stating that screening should begin at age 40.[5]

Despite the fact that researchers such as Catalona and colleagues recommend prostate cancer screening by prostate-specific antigen[5], others have stated that the test is very sensitive, but not specific, leading to over-diagnosis.[6,7] In addition they have argued that screening is expensive and has not been linked to saving lives.[6,7] Nevertheless, PSA testing is currently the widely used screening method for early

prostate cancer detection.[8] Due to the controversies surrounding the use of PSA testing, there are several recommendations. While the ACS suggests that screening with PSA testing begin at age 50 or lower for men at higher risk of developing prostate cancer[3], American College of Physicians recommends not screening all men, but deciding to screen based on potential benefits and known harms of screening, diagnosis and treatment, patient's concerns and decision to screen.[9] The American Urological Association states that monitoring PSA as part of regularly scheduled checkups gives doctors and patients the opportunity to detect problems and begin treatment before a cancer spreads and becomes terminal.[9] However, the National Cancer Institute acknowledges various methods used by doctors, which may include promoting screening for men over age 50 annually, recommending against routine screening or counseling men about the risks and benefits on an individual basis and encouraging patients to make their own decision on whether or not to screen.[9] In contrast to all the recommendations mentioned earlier, Preventive Services Task Force does not recommend screening with PSA testing.[9] With many conflicting guidelines on prostate cancer screening, men's knowledge of the need to screen and the advice they receive from their physicians varies according to the guideline chosen, and the decision to screen with PSA testing may be based on an individual perception of risks and benefit of screening.

Risk Factors

As with most cancers, prostate cancer has been found to be associated with family history of disease, aging, and ethnicity.[2,10,11,12,13,20,21] Those with a family history

have an increased risk of developing prostate cancer compared to those in the general population without a family history.[10] Men with either a father or a brother diagnosed with prostate cancer are two times more likely to develop prostate cancer. This risk increases with the number of first-degree relations diagnosed with prostate cancer.[11,12] Research has determined that 5% to 10% of prostate cancer cases may have a hereditary link. Moreover, 40% of prostate cancer cases occurring before the age of 55 may also be linked to family history.[13]

The chance of being diagnosed with prostate cancer increases with age. [2] The ACS reports that 65% of prostate cancer cases are diagnosed in men aged 65 years and older. At ages less then 39, the probability of getting prostate cancer is 0.005%. For individuals between the ages of 40-59 years, the probability increases to 2.2%, and for those 60-79 years, the chance of developing prostate cancer is 13.7%.[2] The overall lifetime risk for developing prostate cancer is 16.7% (1 in 6).[2]

Several studies have reported that prostate cancer occurs in about 1% of the population of men aged 50 and younger, and these men were found to be more likely to have an adverse outcome than men older than 50.[14,15,16] A study by Smith and colleagues, have found that screening with the PSA test has contributed to earlier diagnosis of prostate cancer in men age 50 years and younger, increasing the chances of survival.[17] This study has limited generalizability since its subjects were men in the military healthcare system taken from only one military hospital site.[17] However, other studies have also found that screening detects prostate cancer earlier, but its effect on survival is not proven.[18,19]

Race and ethnicity have also been found to be associated with developing prostate cancer. There is racial/ethnic disparity in prostate cancer incidence and mortality rates in the United States.[20,21] In 2007, the ACS reported that African American men had a higher incidence for prostate cancer than other racial groups, as well as a higher mortality rate.[1] Browley et al found that African-American men have a higher incidence of prostate cancer than their age-matched white counterparts.[21] In addition, African American men are more likely to be at an advanced stage when diagnosed, and to experience worse outcomes.[22] Even after adjustment for clinical stage of prostate cancer, African American men have been identified to have a higher burden of histologic grade of cancer than white men at time of diagnosis.[23] This advanced staging could in part account for the higher mortality rate in black men.[17] Conversely, black men being identified with a higher burden of histologic grade of cancer than white men could be due to disparities related to screening.[24] Overall, race and ethnicity have been found to be strong predictors of occurrence of prostate cancer.[24]

Screening, Knowledge and Perceptions

Disparities in prostate cancer screening are widespread. In research conducted by Gilligan and colleagues, elderly black men were less likely to be screened for prostate cancer than elderly white men.[24] This finding was significant after controlling for poverty level, co-morbidity, and health care utilization. Gilligan and colleagues found that being non-white was a strong predictor for not being screened for prostate cancer.[24] In addition, an Illinois community-based study on a prostate cancer screening

program by Cookson and colleagues found that African American men were less likely than Caucasian men to be screened for prostate cancer.[22]

Knowledge or awareness seems to be the key to detecting prostate cancer early. Research has found knowledge to be a leading factor in men's decisions to be screened for prostate cancer.[25] However, research has also demonstrated disparities in knowledge of prostate cancer, with African-American men being identified as less knowledgeable about prostate cancer screening.[24] In addition, Price et al. concluded that black men are more likely to have more misconceptions about the disease and health outcomes.[26] Compared to blacks, white men more commonly have been exposed to the knowledge of prostate cancer by being aware of someone who has been diagnosed with the disease.[24] In addition, Cowen and colleagues have shown through research that fewer than 50% of black men knew the recommended age for screening, 45% thought they would die if diagnosed, and 60% were unaware that they were at greater risk than white men to develop and die from prostate cancer.[27]

In contrast to these findings, Demark-Wahnefried and colleagues found no difference amongst races about the perception of health outcomes after being diagnosed with prostate cancer. Both whites and blacks could identify individuals with prostate cancer who led "full and active lives".[28] Although prostate cancer is one of the most commonly diagnosed cancers and among the top causes of cancer deaths in the United States, screening rates for this cancer remain low and the disparity in screening rates between white and black men remains high.[2,22,24,28]

Some studies have found no association between screening for prostate cancer and perceived personal risk of the disease[29,30,31,32] However, Jacobsen et al. found that stronger intentions to be screened for prostate cancer among men with family history of the prostate cancer could be explained by having a greater perceived risk of developing the disease.[33] Moreover, breast cancer research have shown that women with higher levels of perceived risk and a family history of the disease where more likely to obtain mammography.[34,35]

The studies reviewed evaluated men with family history of prostate cancer, who are at a higher risk of getting prostate cancer. In addition to evaluating men with family history, research by Jacobsen et al. focused on the intention to screen instead of screening in actuality.[33] Our study is being conducted amongst men, without a history of prostate cancer, to determine if there is a relationship between screening with PSA testing and perceived personal risk. As research by Bloom and colleagues suggests that perceived risk may provide the motivation to obtain screening with PSA test[32], we hypothesized that screening would be associated with perceived personal risk.

Methods

Data Source

Data for this study was obtained from the 2003 Health Information National Trends Survey (HINTS). HINTS is a nationwide, cross-sectional survey of adults representative of the U.S. population.[36] The survey was administered to one adult aged 18 or older per selected household to obtain a picture of the American population's need for, access to, and use of information pertaining to cancer. Trained interviewers administered the survey questions using a computer-assisted telephone interviewing system.[37] The 2003 HINTS dataset was collected from October 2002 to April 2003. The survey had a final response rate of 62.8%.[37]

Study Population

The sample selection for HINTS was a random digit dialing (RDD) sample from all telephone exchanges in the U.S., oversampling non-Hispanic blacks and Hispanics to create a nationally representative sample of households.[36] The HINTS study sample was obtained from the civilian, non-institutionalized adult population.[36] For this study, the participants were men ages 35 and above with knowledge of prostate cancer screening and without history of prostate cancer. All persons ages 18-34 were excluded from the study.

Variables

In the 2003 HINTS, a sampling weight and a set of replicate sampling weights were applied to every sampled adult who completed the questionnaire, to achieve a nationally representative sample. The outcome variable for this study is screening for

prostate cancer, and the main exposure variable is perceived risk for prostate cancer. Potential covariates selected for analysis were access to health coverage, healthcare provider recommendation for screening with PSA test, body mass index (BMI), family history of cancer, one's general health, and worry frequency, defined as how often one worried about the risk of getting prostate cancer. Also included in the model were the demographic variables such as marital status, race, age, educational level, and household income. Health coverage was coded as yes or no in response to the question, "Do you have health coverage of any kind?" The Centers for Disease Control and Prevention (CDC) categories were used to recode BMI as healthy weight (18 to <25), overweight (25 to <30), and obese (30+). Family history of cancer was coded as yes or no. One's general health was recoded as good, fair, and poor.

For the demographic variables, marital status was recoded as single, married, divorced or separated, and widowed. Race was recoded as white, black and other, and age was categorized as 35-49, 50-64, and 65+. Age categories were selected to correspond with the screening recommendation of the American Cancer Society, which states that prostate cancer screening should began at age 50. Educational level was recoded as less than high school, high school graduate, some college or college graduate to keep within the categories that often are used in analyses of prostate cancer data. The HINTS categories for household income were used (<$25,000, 25,000 to <50,000, 50,000-<75,000, and 75,000 and above). Worry frequency was recoded as never or rarely worry, sometimes worry, and worry often or all the time.

Perceived personal risk for prostate cancer was measured by the survey question, "How likely do you think it is that you will develop prostate cancer in the future?" Answers to perceived personal risk were recoded as low, moderate, and high. In addition, healthcare provider recommendation for screening by PSA testing, was measured by the survey element, "During the past 12 months, have your ever been advised by a healthcare professional to have a PSA test?" Study participants rated this question as yes or no.

Prostate cancer screening, by PSA testing, was measured by the question, "If knowledgeable of prostate cancer screening, have you ever had a PSA test?" Study participants' responses were coded as "yes" or "no".

Statistical Analysis

We obtained the frequencies and weighted percentages to describe the distribution of the population. In addition, we performed the chi-squared test of association to explore the relationship between the outcome and the main exposure, as well as the covariates. Furthermore, we conducted univariate logistics analyses to obtain crude prevalence odds ratio and 95% confidence limits. Initially, we ran the logistic model with all the variables to access the effect of the covariates on the association between perceived personal risk and PSA screening. A reduced model, in which variables with non-significant Wald chi-squared statistic had been excluded, was compared to the full model to access the change in parameter estimates. Clinically relevant interaction terms were added, one at a time, to the main effects model to determine their effect on the outcome.

Using the "model-based" approach (which ignores study design and statistical weights and handles the data as a simple random sample), we compared models with interaction terms to the one without interaction terms using the likelihood ratio test.[38] Parameter estimates from the best fitting model were reported using the "design-based" method (which takes the survey design and statistical weights into consideration).[38] SAS version 9.1 statistical software was used for analyses.

Result

The study sample comprised of 1,815 men. Nearly one-half (47.1%) of the study participants were aged 35-49, and close to one-third (31.6%) were aged 50-64. The oldest participants (aged 65 and above) made up the smallest proportion (21.3%). Whites accounted for the majority (82%) of the study population, blacks comprised approximately 10% of the respondents, and men of other races made up the remainder (8%). The largest proportion of study respondents had a high school degree (31.7%), with college graduates accounting for the next largest proportion (28.4%). Nearly one-quarter (23.6%) had some college education, and 16.3% had less than a high school degree. About, 46.7% of our study population perceived their risk of getting prostate cancer as low compared to 38.9%, who perceived their risk as moderate, and 14.4, who perceived their risk as high. (Table 1).

The prevalence of PSA screening for men ages 35 and above is high in our population (Table 2 see Appendix). Approximately 64% of men, who perceived their risk of getting prostate cancer as low, screened with the PSA test. As well, 59% of men who perceived their risk as moderate and 67% of men who perceived their risk as high screened with the PSA test for prostate cancer. An overwhelming 87.9% of men ages 65 and above, 69.6% of men ages 50-64, and 40.6% of men aged 35-49 screened for prostate cancer with the PSA test. Over, 96 % of men who obtained a health provider recommendation to screen for prostate with PSA test adhered to their provider's advice. However, only 32.6% of those who did not get health provider recommendation did screen with PSA test. Moreover, 65% of men who had healthcare also screened with

PSA test compared to 28.5% of those who did not have health coverage. Table 2 also shows the chi-square test of association between each variable and the outcome.

From the univariate analysis the variable that shows the most significant association with the outcome was health provider recommendation for PSA testing. The odds ratio (95% CI) of those who received health provider recommendation for PSA testing compared to those who didn't received any advice was 60.19 (29.06, 124.65) (Table 3 see Appendix). The odds ratio (95% CI) of those who perceived their risk as moderate compared to those who perceived their risk as low was 0.81 (0.58, 1.14), showing no significant difference. The odds ratio (95% CI) of those who perceived their risk as high compared to those who perceived their risk as low was 1.14 (0.73, 1.77). The odds ratio of those who had health coverage compared to those without health coverage was 4.67 (2.47, 8.85). Also shown in table 3, the odds ratio for black compared to white men was 0.87 (0.52, 1.45), and that for men of other races compared to white men was 0.61 (0.31, 1.19). The odds ratios (95% CI) of men ages 50-64 and 65 and above compared to those ages 35-49, were 3.34 (2.26, 4.95), and 10.58 (6.49, 17.25), respectively.

Multivariate Analyses

Table 4 summarizes the adjusted odd ratios and 95% confidence intervals from the logistic regression analysis (Table 4 see Appendix). We found a significant interaction between perceived personal risk of getting prostate cancer and age (Table 5 see Appendix). Among men ages 35-49, those who perceived their risk as high, were significantly less likely to screen than those who perceived their risk as low (OR: 0.20

95% CI: 0.05-0.78). However, there was no significant difference between men who perceived their risk as moderate and those who perceived their risk as low. Within ages 50-64 and 65 and above, there were no significant differences between perceived risk levels and PSA testing. Nevertheless, as men aged, their odds of screening increased (Figure 1 see Appendix). Relative to men ages 35-49 with a low perceived risk, persons 65+ with moderate or high perceived risk seem to show 9.0 to 12.2 times increased odds of screening (Figure 2 see Appendix).

Additionally, men who did receive healthcare provider recommendation to screen for prostate cancer with PSA test were more likely to screen than those who did not receive healthcare provider recommendation (OR: 92.56 95% confidence interval: 36.56, 234.36). The adjusted model shows no significant difference between men who had health coverage and those without (OR: 3.27 95% confidence interval: 0.72, 17.79). There was also no significant difference amongst men of different levels of education, state of general health, category of race, and household income. Men with a family history of cancer were not found to be significantly different from those with no family history (OR: 1.42 95% confidence interval: 0.80, 2.51).

Discussion

The American Cancer Society (ACS) recommendation is that prostate cancer screening begins at age 50 years, and should include prostate-specific antigen (PSA) testing.[2] In addition, ACS recommended that screening for men with a family history of prostate cancer and African American men begin at age 45, due to a higher risk in these populations.[3] Despite the recommendation, there is a controversy over the effect PSA testing has on survival. However, research has shown that PSA testing detects cancer earlier, which theoretically should increase the chances of survival.[8] Our study found that the relationship between perceived personal risk of getting prostate cancer and PSA testing is modified by age. As men aged, we found that those who perceived their risk of getting prostate cancer as moderate or high, were more likely to obtain screening (PSA test) than men who perceived their risk as low. As well, men who perceived their risk as high were more likely to screen as they aged compared to men who perceived their risk as moderate.

In consistence with pervious research by Rutten and colleagues[37], men who did receive healthcare provider recommendation to screen with PSA testing were more likely to have had the test then those who were not advised to screen with PSA test; this finding demonstrates that healthcare providers play a major role in getting their patients screened for prostate cancer, and might explain the high prevalence of prostate cancer screening with PSA test for men 50-64 and 65+ who perceived their risk of getting cancer as moderate or high. Other research has also shown that healthcare providers

have a key role in men's decision to undergo screening, and stressed the need for patient participation in the decision-making process of their health.[37,39] Moreover, healthcare provider recommendation being a strong predictor of screening with PSA testing is similar to the numerous previous findings for screening for other cancers, where healthcare provider recommendation is a strong predictor of adhering to mammogram and colorectal cancer screenings.[37,40,41,42] We found no significant association between worry frequency, health coverage, marital status, race, and household income.

Limitations

Screening with PSA test was self reported by study participants. Self reporting is a possible limitation because it produces the chance for over reporting or underreporting of our outcome and independent variables. For PSA testing, several studies have linked underreporting to the nature of the test or the fact that men were unaware that they had been screened for prostate cancer with PSA test.[37,43,44] (Rutten 2005, Jordan 1999 and Chan 2004). Another limitation is the lack of detailed information on doctor-patient communication about PSA testing that prompted screening. In addition, the lack of further information on why men perceived their risk as moderate or high is also a limitation of our study. Furthermore, being a cross-sectional study, we are unable to establish a cause-effect relationship between screening and perceived personal risk. Another limitation of our study is the relatively small sample size which might have made our effect estimates unstable.

Strengths

A major strength is that our study includes population-based sample. Hence, data reflects population at large, and generalizability to men in the U.S. is a major advantage. Our study also contributes to the body of literature on perception of risk and screening of prostate cancer (PSA testing).

Recommendations

We recommend further research on doctor-patient communication and its impact on perceived risk of getting prostate cancer to evaluate why men are more likely to screen, taking into consideration barriers to communication to include language and racial differences. Finally, we recommend more research on education and screening to further evaluate the major differences between groups such as income level and access to primary provider care.

Conclusion

Our study found that the relationship between perceived personal risk of getting prostate cancer and PSA screening is modified by age. If perceived personal risk of getting prostate cancer is moderate or high, men ages 50-64 and 65+ showed increasing odds of screening as they grew older (Figure 1). The most significant predictor of PSA screening was, however, health provider recommendation. PSA screening showed no association with either race or household income.

Appendix

Table 1: Distribution and weighted Percents for characteristics of Men aged 35 and above without History of Prostate Cancer

	Total (N)	Weighted Percent (%)
Perceived Personal Risk		
Low	761	46.7
Moderate	643	38.9
High	246	14.4
Worry Frequency		
Rarely or Never	1171	68.2
Sometimes	446	25.7
Often or All the time	94	6.1
Health Coverage		
No	187	10.8
Yes	1574	89.2
Healthcare Provider Recommendation for PSA Testing		
No	402	48.4
Yes	465	51.6
Education		
Less than High School	205	16.3
High School Graduate	509	31.7
Some College	425	23.6
College Graduate	618	28.4
Marital Status		
Single	209	9.5
Married	1150	75.67
Divorced or Separated	364	13.1
Widowed	37	1.69
Household Income		
< 25,000	372	23.4
25,000- <50,000	496	29.7
50,000- <75,000	301	19.1
>=75,000	462	27.8
Race		
White	1368	82
Black	180	9.9
Other	126	8.1
Age		
35-49	799	47.1
50-64	593	31.6
65+	420	21.3
BMI		
Healthy Weight	523	27
Overweight	839	46.1
Obese	453	26.9
Family History of Cancer		
No	692	38.83
Yes	1100	61.17
General Health		
Good	1414	78
Fair	264	16.5
Poor	84	5.5

Table 2: Prevalence of PSA Screening of men age 35 and above without history of prostate cancer and p-value for Chi-square test of association

	Total (N)	PSA Screening Yes (%)	Chi-square P-value
Perceived Personal Risk			0.25
Low	421	64.1	
Moderate	405	59.1	
High	169	67	
Worry Frequency			0.19
Rarely or Never	677	60.2	
Sometimes	300	67.8	
Often or All the time	47	62.7	
Health Coverage			<0.0001
No	70	28.5	
Yes	950	65	
Healthcare Provider Recommendation for PSA Testing			<0.0001
No	384	32.6	
Yes	461	96.7	
Education			0.75
Less than High School	74	63	
High School Graduate	257	59.7	
Some College	243	62.8	
College Graduate	444	65.1	
Marital Status			0.16
Single	109	47.75	
Married	714	64.17	
Divorced or Separated	187	64.46	
Widowed	10	68.78	
Household Income			0.35
< 25,000	171	59.5	
25,000- <50,000	254	68.1	
50,000- <75,000	188	59.2	
>=75,000	326	61	
Race			0.29
White	834	63.9	
Black	96	60.6	
Other	52	51.8	
Age			<0.0001
35-49	360	40.6	
50-64	399	69.6	
65+	266	87.9	
BMI			0.97
Healthy Weight	269	63.2	
Overweight	507	62.1	
Obese	250	63.9	
Family History of Cancer			0.67
No	692	61.8	
Yes	1100	63.45	
General Health			0.23
Good	1414	61	
Fair	264	70	
Poor	84	69.4	

Table 3: Prevalence Odds ratio examining the association between PSA screening of men with knowledge of Prostate cancer and Perceived Risk

	POR	Lower Confidence Limit	Upper Confidence Limit
Perceived Personal Risk			
Low	1		
Moderate	0.81	0.58	1.14
High	1.14	0.73	1.77
Worry Frequency			
Rarely or Never	1		
Sometimes	1.39	0.98	1.97
Often or All the time	1.11	0.54	2.29
Health Coverage			
Yes	4.67	2.47	8.85
No	1		
Health Provider Recommendation for PSA Testing			
Yes	60.19	29.06	124.65
No	1		
Education			
Less than High School	0.91	0.51	1.63
High School Graduate	0.79	0.55	1.94
Some College	0.9	0.6	1.36
College Graduate	1		
Marital Status			
Single	0.51	0.22	1.19
Married	1		
Divorced or Separated	1.01	0.67	1.53
Widowed	1.23	0.31	4.89
Household Income			
< 25,000	0.94	0.56	1.57
25,000- <50,000	1.37	0.91	2.06
50,000- <75,000	0.93	0.61	1.4
>=75,000	1		
Race			
White	1		
Black	0.87	0.52	1.45
Other	0.61	0.31	1.19
Age			
35-49	1		
50-64	3.34	2.26	4.95
65+	10.58	6.49	17.25
BMI			
Healthy Weight	1		
Overweight	0.96	0.67	1.37
Obese	0.99	0.63	1.54
Family History of Cancer			
No	1		
Yes	1.07	0.78	1.48
General Health			
Good	1		
Fair	1.49	0.88	2.54
Poor	1.45	0.63	3.35

Table 4: Logistic Regression Model examining the association of Perceived Risk and PSA testing

	Coefficents	POR	Lower Confidence Limit	Upper Confidence Limit
Perceived Personal Risk				
Low				
Moderate	-0.7086			
High	-1.6143			
Health Coverage				
Yes	1.1852	3.27	0.72	17.79
No		1		
Health Provider Recommendation for PSA Testing				
Yes	4.5279	92.56	36.56	234.36
No		1		
Education				
Less than High School	-0.2887	0.75	0.18	3.19
High School Graduate	-0.9649	0.38	0.18	0.81
Some College	-0.4028	0.67	0.33	1.38
College Graduate		1		
Marital Status				
Single	1.4043	4.07	1.31	12.62
Married		1		
Divorced or Separated	0.00725	1.01	0.45	2.28
Widowed	-0.1171	0.89	0.23	3.47
Household Income				
< 25,000	-0.3374	0.71	0.21	2.49
25,000- <50,000	-0.0368	0.96	0.42	2.19
50,000- <75,000	-0.5465	0.58	0.27	1.23
>=75,000		1		
Race				
White		1		
Black	-0.3903	0.68	0.23	2.03
Other	-1.4116	0.24	0.02	2.57
Age				
35-49				
50-64	0.6968			
65+	1.4876			
Family History of Cancer				
No		1		
Yes	0.3497	1.42	0.8	2.51
General Health				
Good		1		
Fair	0.7026	2.02	0.76	5.35
Poor	0.836	2.31	0.49	10.82
Perceived Personal Risk*age				
Low*35-49				
Moderate*50-64	0.3373			
Moderate*65+	1.4185			
High*50-64	1.0162			
High*65+	2.6252			

Table 5. Adjusted Odds ratios for the association between perceived risk and PSA testing by age

	Age category		
Perceived risk	35-49	50-64	65+
Low	1	1	1
Moderate	0.49 (0.19 - 1.26)	0.69 (0.27 - 1.73)	2.03 (0.38 - 10.91)
High	0.20 (0.05 - 0.78)*	0.55 (0.14 - 2.21)	2.75 (0.31 - 24.26)

Figure 1: Odds ratios for the association between perceived personal risk and PSA testing by age

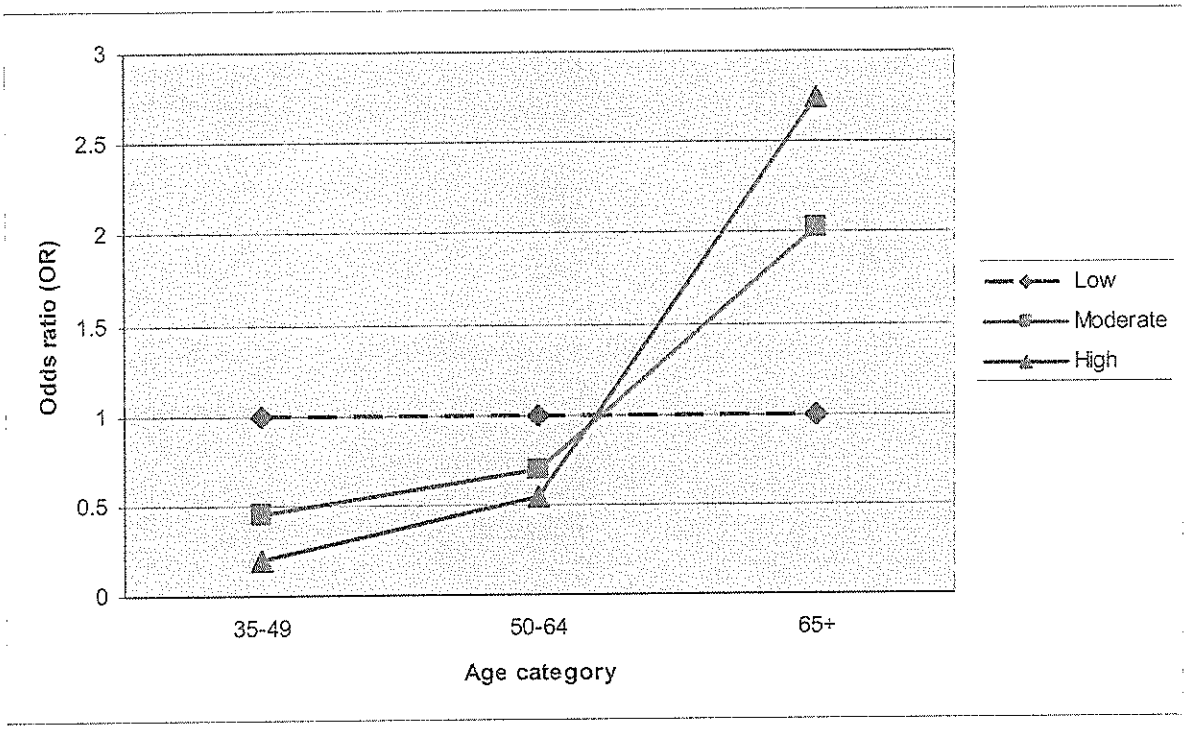


Figure 2: Odds ratios for the association between perceived risk and PSA testing by age

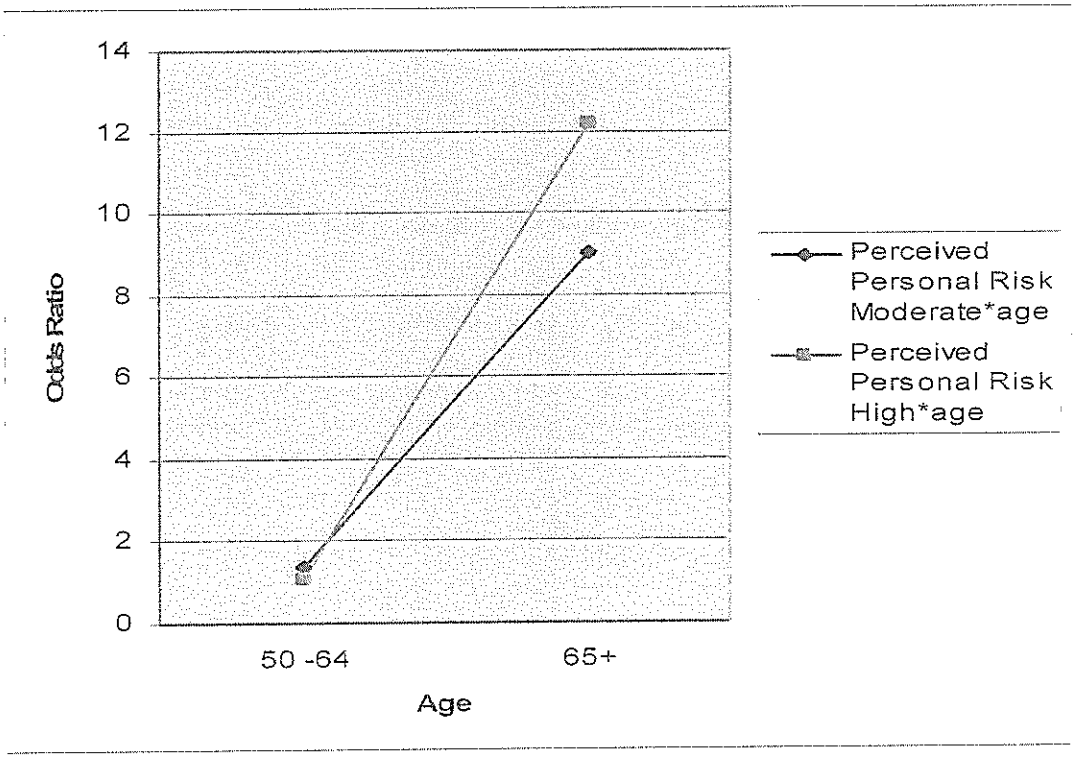
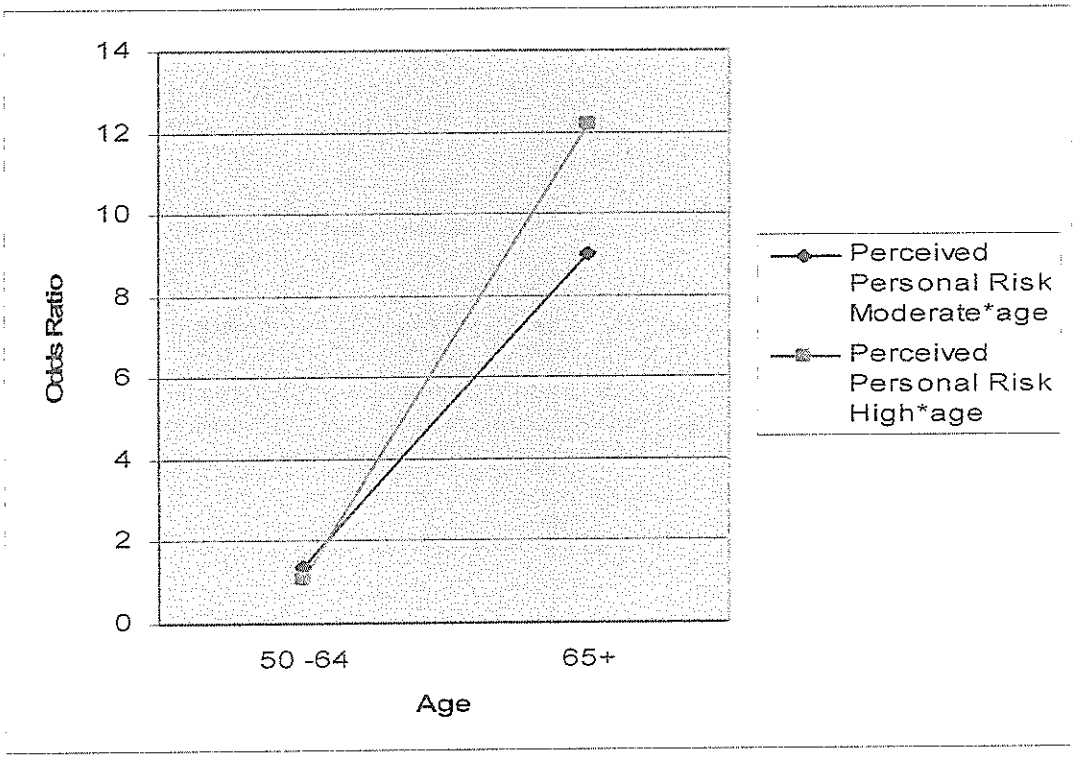


Figure 2: Odds ratios for the association between perceived risk and PSA testing by age



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